THE PROJECT METHOD IN PHYSICS AND CHEMISTRY

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The sciences of physics and chemistry, while offering subject-matter most interesting to high-school students, do not seem to enjoy the popularity in high school that should be theirs. This lack of popularity does not perhaps make itself apparent in the enrolment in these two courses. The appeal of the intricate-appearing machinery in the physics laboratory and the lure of the interesting odors evoked by apron-clad classmates in the chemistry room take care of the enrolment. But after the student is enrolled in one of these classes, his interest often declines.

After seven years of experience in class teaching, coupled with considerable observation as a principal, the writer feels that physics and chemistry as commonly taught in the high school do not arouse, as they should, a desire on the part of the student for further study of the sciences. It is expedient, therefore, to inquire in what ways the methods of teaching are at fault. In the first place, in the common method of teaching where all of the students are kept in one group, each day's work, instead of being a quest for information, is simply a task assigned by the teacher, at which the brighter student must soldier in order not to finish too soon and through which his slower classmate must hurry, perhaps only half comprehending, in order to keep up with the middle third for whose speed the assignment is designed. Laboratory work, which should be most interesting and valuable, too often loses its appeal because the time allotment is fixed for the group, and many students are behind or ahead, either performing experiments for which they have not had the proper textbook basis or, even worse, performing experiments the results of which they already know from class discussion.

A plan which the writer has used for three years seems to eliminate at least some of these difficulties. The first year the plan was tried the classes accomplished considerably more than had been accomplished by previous classes, and nearly all of the students who were not then Seniors were interested in taking an advanced course in the subject the following year. The idea is not set forth as something new; it is simply an application of the project method with provision for supervised study. It works best under the common double-period program. The class should have the use of two rooms, one the laboratory and the other a study room. In this study room absolute quiet should prevail. If the students are allowed to talk freely in the laboratory and are asked to go in there if they wish to converse, they soon respect and appreciate the quiet of the study room.

Assignments are made in the form of lesson questions or topics, mimeographed so that each student may have a copy. The questions should be so devised that the answers call for real thinking on the part of the student, which thinking needs real textbook or laboratory work as a basis. Students, in preparing the lessons, work out the questions or topics in the order given, and the teacher has opportunity to have the laboratory experiment which is indicative or illustrative of a certain point performed at a time when it is of the greatest value. Outside reference work should be given as well as field and observation work.

In addition to the questions which all of the students are required to prepare are several which are designated "A" work. This may be extra laboratory work or a side-line investigation which may appeal to the student. Often the students themselves suggest work that they would like to do beyond the regular assignment and ask to be given credit for it. Recognition of this extra work may be given by means of tenths of credits.

After a student feels that he has prepared a lesson, he goes to the teacher for individual recitation. It might seem that this procedure would take a great deal of the teacher's time, but often two or more students may be ready to recite at the same time on the same lesson. In a general class recitation each student is tested on only a small portion of the entire day's work, and in an

individual recitation it need not be more. Of course, the slow student should be given more time. Some abstruse point may need skilful development in the case of a few students. While the explanation is being given, ten or twelve other students who understand it perfectly are not kept listening.

It seems to be conducive to good work to keep the record of the class either on the blackboard or on a chart posted where the individual may watch his progress daily. The writer added a hypothetic member to his class, whom the students named Johnny Average, whose progress was kept at what was considered normal rate.

Of course, if this routine were carried out without break, a great deal of value would be lost. Class discussion, demonstration experiments, lectures by the instructor, the presentation of individual projects to the class, etc., should not be given up. The students may be called into formal class meetings at any time. However, it has been the experience of the writer that formal recitations where the instructor is the central figure tend to become fewer in number. Lectures and methods of development that were considered essential seem to become less indispensable. The students seem relieved when the recitation is over and they are allowed to go back to their individual work. This attitude, while at first a little disconcerting to the instructor, simply indicates that the real aim of the program is being accomplished; that is, the student is realizing the value and interest of individual, independent effort and is confident of his power to accomplish by means of such effort.